

# Antecedents of Cloud ERP Adoption in Manufacturing Industry: Nigerian SMEs Context

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## ABSTRACT

Cloud ERP systems are continuously replacing the implementation of traditional ERP systems within the enterprise industry, the cloud ERP system's ability to exploit internet's continuity. The increased reliability of cloud infrastructures has made it economically feasible to deliver ERP systems over the internet, at less risk than that involved with traditional ERP, allowing for the transfer of maintenance and support to the vendor. Cloud ERP system also enables small and medium-sized budget organizations to access incredibly robust technology at an affordable cost, and at a low cost of ownership, with quick deployment and a fast return of investment. Manufacturing company today are faced with challenge as the world is moving faster and more connected than before, nature of world economy, growth in consumer technology, and rapidly changing and sometimes, unpredictable consumer purchasing behaviors, all brings both opportunity and risk, as a result manufacturer need to invest in the next generation of industrial automation solution. Factors that are significant to influence adoption cloud ERP in SMEs are still unclear, mainly in the context of developing countries and Nigeria in particular. Therefore, this research paper discusses various potential factors from relevant literature that would influence manufacturing SMEs to adopt cloud ERP system.

**Keywords:** Cloud, Enterprise Resource Planning (ERP), SMEs

## I. INTRODUCTION

Enterprise Resource Planning systems (ERP Systems) can effectively support the functionalities and business performance of small and medium enterprises (SMEs), the SMEs can also be benefit in terms of managing organizational information (Prashant Gupta and A. Seethraman, 2013). Cloud ERP systems are used in a format where users rent the software instead purchasing the software. (Ivanov 2012). By renting the software, organizations can minimize implementation and maintenance costs, and can also gain access to an ERP system that allow SMEs to focus more on their organizational missions without needing to devote substantial resources to

maintaining ERP software (Salim Siti Aisyah. 2013). There are few resistances because of which cloud ERP is not yet widely accepted by the SMEs in some developing countries. Due to very little research has been conducted on cloud ERP adoption in the past in Africa with most studies having been carried out in Europe (Equey & Fragniere 2007, Olhager & Selldin 2003), Asia (Upadhyay & Dan 2009:3), Australia (Zhou, Xing & Nagalingam 2010:306). However, the adoption rate of cloud ERP in Nigeria is still in the beginning stage with not many adoptions within the SMEs. This study focuses on the adoption of cloud ERP among Nigerian SMEs in manufacturing industry. This is because obtaining such opportunities rests largely upon the ability of SMEs to engage in the regional and global economic business networks which in turn demand provision of a prerequisite level of access to and use technology. The cloud ERP evolution had made it easy and lower cost for SMEs to afford for their business process and managing organizational information. Accordingly, the willingness to adopt cloud ERP systems among SMEs in Nigeria remains low.

Therefore, this research seeks to address the gap by highlighting some factors that influence the adoption of Cloud ERP systems by manufacturing SMEs in Nigeria. The current gap in the literature has led us to the following research question: what factors influence cloud ERP adoption in manufacture industry among SMEs in Nigeria? To accomplish the understanding of these factors, the researcher developed a model of cloud ERP adoption using factors from previous findings.

The research paper is structured as follows: first, we provide an overview of ERP and cloud ERP systems based on the extant literature. Next we analyses the adoption model of cloud ERP through five themes, which includes; external support, organizational support, technology applicability, external pressure and internal pressure. The paper concludes with suggested future study direction and research implications regarding academic and practical work.

## II. THEORETICAL BACKGROUND AND RESEARCH MODEL

A number of researches have been done to draw systematic study of cloud ERP adoption. Pareek

(2014) have tried to compare all aspects of traditional ERP systems with cloud base ERP architectures. He found that the cost of the cloud ERP implementation is lower than that of traditional implementation and flexibility of cloud ensures competitive advantages to a particular company. Weng and Huang (2014) have also identified different benefits and challenges of cloud ERP. The study of Duan et al. (2013) is almost similar with the study of Weng and Hung, which identify and classify the benefits and drawbacks of cloud-based versus traditional ERP systems. They explored that cloud ERP systems provide mature system functionality and abilities of greater customization and integration. Navaneethakrishnan (2013) revealed that Cloud ERP system provides solutions to all the difficulties encountered by convention ERP systems. It provides flexibility and improves overall efficiency of the organization. Sahin (2013) identified potential security issues arising from deploying of the cloud ERP systems from provider perspectives in order to contribute current knowledge in cloud ERP implementation in Sweden. Singh and Nagpal (2014) analyzed the issues concerning with the execution of ERP in cloud computing. They mentioned that lot of the researches focused on one topic and few of them have taken both as a study. They covered diverse aspects of both ERP and Cloud Computing and after studying their major benefits and challenges they suggested few recommendations. Cloud ERP is a mix of standard ERP services along with cloud flexibility. Sharma and Keswani (2013) draws a framework for selecting non-core business process from preferred ERP service partners and also recommends which ERP services outsourced first over the cloud, and the security issues related to data or information moved out from company premises to the cloud eco-system. The goal of Al-Johani and Youssef (2013) study is to merge ERP and cloud computing benefits together to reduce the factor of expenditure cost and implementation delays through a proposed framework. Their framework for “Cloud based ERP systems” follows multi-instance based cloud infrastructure that initiates different ERP instances for different industries. Zhang and Wang (2013) proposed an engineering approach and methodology of constructing the knowledge driving, cloud-based ERP service system for Small and Medium Sized Enterprises (SMEs). Salim (2013) have identified 27 transition factors contributing to the adoption of cloud ERP based on a content analysis of one hundred studies. He classified transition factors as “necessary” or “sufficient”; where “necessary” transition factors need to exist in order for the firm to move to the next stage, while “sufficient” means assisting in the movement. From the literature, it is observed that most of the research has focused more on benefits and challenges of cloud ERP; framework developed from precious authors for

cloud ERP, and factors toward cloud ERP adoption from provider’s perspectives. Only few numbers of studies have focused on the organization or end users perspective that plays a significant role in successful adoption of cloud ERP. This study attempt to fill the gap, by analyzing the adoption and acceptance issues of cloud ERP based on user’s perspectives.

Based on the above section discussion, factors such as cost, security, and privacy have a considerable effect on cloud ERP adoption. Therefore, in any effort to conduct study into matter of cloud ERP adoption, three constructs such as data security, cost and privacy is imperative to add into the TAM-DTM model. TAM modified the version and TAM-DTM has widely used in previous studies considering adoption of new technologies (López-Nicolás, et al., 2008; Wu, Lan, & Lee, 2011). Hence, based on the discussions presented in section above, these three constructs and other factors that are prior in most of the studies in adoption were examined in TAM model. Consequently, this research suggests TAM model that combine related theories with the imperative construct such as security, privacy and cost in order to gain more insights into the adoption of cloud ERP.

Based on Figure 1, there are factors such as cost and security that are important factors to be considering for adoption of cloud ERP based on prior studies in Nigeria. Hence, these constructs selected according to their number of appearance in different studies, to add TAM-DTM model. They have considerable impact on cloud ERP adoption in terms of users’ perspectives



Figure 1. Research Model.

**Organizational factors:** The organizational factors have an effective impact on organization intention to adopt the new information systems technology; this study will look into dimension that represents different organizational conditions, which include variables such as support from top management, adequate resources, and the benefits of adoption. For the management's support, it depends on how well the executives understand the whole nature and functions of cloud-based ERP system and then the fully support its adoption in the organization.

Chang et al. (2006) conducted a study, which found that top management's support would affect the adoption of new information systems. Cloud technology is usually a huge project and it's undertaking for organization, a guarantee support from the executives is usually critical for creating a support and providing adequate resources for adopting the new technology. As the technology is increasing by its rate of complicity, the executive management provide vision and commitment to ensure sustainable environment for innovation.

The top management decision to adopt cloud ERP system is very crucial, as the implementation of the system will result changes such as resource integration and reengineering of information within the organization. By regarding this discussion, this dimension is consisting of four variables, which include: top management support, performance the implementation cost, and benefits of implementing the system.

**H1:** There will be a positively significant relationship between benefits and the adoption of cloud ERP adoption.

**H2:** There will be a positively significant relationship between cost implementation and the adoption of cloud ERP adoption.

**H3:** There will be a positively significant relationship between performance and the adoption of cloud ERP adoption.

**H4:** there will be a positively significant relationship between the top management support and the adoption of cloud ERP

**Technological Factors:** Observing the technology applicability which includes: the data security, compatibility, complexity and implementing cost of technology. Based on previous researchers, the complexity and compatibility of information system will positively have impact towards the adoption of specific information technology within an organization. As result, the nature of cloud ERP technology, securing data and information privacy are most crucial and concerning issue related to ERP

adoption. This makes it necessary for the development of a secure environment for cloud based ERP system data integration and sharing information flowing within system is critical, for this reason data security become one of the key variables in technology dimension. Research shows that, the complexity factors of new technology, usually has a negative effect, as the complexity of an innovation can be a barrier to the implementation of new technology, most organizations are lacking the confident on cloud system, because it appears unfamiliar to embarrass, this will make their decision of accepting and implanting the new system take a long time decision-process. As a result, the complexity of any new system is a key criterion during decision making to adopt ERP system. The systems most show a potential functionality of handling complex tasks and other organizational information. Another critical factor that the organization need give important consideration when making a decision to adopt cloud ERP system is the migration from the traditional system to the new emerging cloud system. This is very important factor, as no organization will accept migrating to new system with considering the privacy and security with the existing information that keep the organization running.

New technology is only adopted by any organization when it is compatible with the work application system of the specific organization, if technology appear to be incompatible with current application system of an organization, it's likely the organization will not adopt the new technology, because the compatibility factors it determined by degree in which innovation fit with the potential adopter's existing values, previous practices and current needs. Another key factor which within the technical dimension is the level of system compatibility, if the cloud technology is well compatible with the current systems or the application of organizations, therefore the adoption will be positively more impact and feasible. As a result of varied and extensive nature of costs, the companies can look for an expensive with this kind of project to be sizable to fit their business process, with this reason; costs are a critical factor for the adoption decision.

**H5:** There will be a positively significant relationship between Data Security and the adoption of cloud ERP adoption.

**H6:** There will be a negatively significant relationship between relatively advantage and the adoption of cloud ERP adoption.

**H7:** There will be a positively significant relationship between compatibility and the adoption of cloud ERP adoption.

**H8:** The adoption of Cloud ERP has had a positively-significant relationship with the scalability

**Local Factors:** From the literature review in adopting into innovation, local factors are highlighted as important key driver of adoption (e.g., Grover and Teng 1994, L. et al. 1995; Premkumar and Roberts 1999) small and medium enterprises are normally under pressure for not only competitiveness, but there are pressure from other sources. Although when comparing other related pressure, technology adoption is influence more from competitors pressure, competitive pressure can be refer to the level of pressure any organization is placed under by competitors within it industry. The strategical way SMEs take which normally rely on trading partnership such as user, can bring extensive consideration for adoption of cloud ERP (Pan and Jang 2008). Based to several studies presented, the pressure exerted by large users, onto smaller training partners can result in the need for adoption of technology (Premkumar 2003)

A study by Chan and Ngai (2009) showed that, the majority of companies were curiously like their competitors are pushing them with pressure, this curiosity leads them to adopt the new technology. The adoption decision making process was also validated by the used of an influential theory. In which trading organization's partner fully influence one perspective organization (Chan and Ngai 2009), when they are also pressured by the suppliers (Caldera and ward 2007) SMEs are also pressured to employ standard systems, that are used as their competitors for business partnership continuity.

As a result, affordability that makes organizations (SMEs) to adopt the new cloud system customized cloud ERP system can maintain the existing relationship with the traders (Khoumbati et al. 2006) the enforcement of any new polity can have an influence on technology innovation (Teo and Ranganathan 2010)

Another external pressure may come from the government, according previous researcher (McKeon, 2012) the US government deployed cloud social network by the used of salesforce.com site, this affect several US department and other governmental agencies within the country, this shows that organizations can also receive pressure from the government that will lead to adopt new technology.

Internal pressure is often from the gap in an organization's performance towards its product and

service, this lead the organization to adopt with new technology system to be competent in its performance, the gap can be as a result of uncertainty of company's target market, where an organization needs to innovate to new technology to be competitive among. Although mobilizing and leveraging assets that are owned by other enterprises can be the means to grow SMEs (Hagel 2002). As a result, implementing new technology is needed to seal the gap, upgrading and maintaining technology infrastructure.

Based on the several works of different researchers (e.g. Kamal, 2006, Moon and Norris 2005) agreed that, support from external parties within the locality is an important factor that influence adoption, Factors that cannot be control or change by organization are called local factors (Quaddus and Hofmeyer 2007). These factors help to update the organization with an effective new technology to be adopted to survive in this dynamic world of technology. As opposed to just pressure to adopt the ERP cloud. Technical diffusion agencies, innovation manufacturers and innovation vendors all have roles to play in dispersing new technology products or services (Von Hippel 2007). Support from industry associations can be in the form of advice and experience from another industry association (Kole 1983), in providing a better understanding of business environments that they are working on together. Another example of support that could influence the adoption of new technology is through a subsidy. Tax exemption can be a meaningful incentive for SMEs, as it can help them to manage their financial scarcity.

**H9:** The adoption of Cloud ERP has had a positively-significant relationship with the government subsidy

**H10:** The organization performance has a positively-significant relationship with users/suppliers.

### III. CURRENT RESEARCH DIRECTION

This study will explore the list of most influential (priority) factors that lead to cloud ERP adoption within SMEs in manufacturing industry at the final decision making and discusses the preliminary findings of research attempting to identify and categorized each of the factors extracted from the literature. Considering the factors identified could be from internalize (organizational factors) or externalize (external factors), the goal is to derive a comprehensive, robust, valid and applicable model to cloud ERP adoption targeting small-medium enterprises (SMEs) within manufacturing industry in Nigeria.

This research analysis activity will provide useful insights into the relationship between these factors, findings or result from this study are solely based on primary and secondary data which are from

questionnaires and past literatures respectively, therefore the most motivational factors are limited to range that has been identified in the literatures.

The study will not only provide implication to academic research by providing potential set of cloud ERP adoption factors but will also provide insight ideas on this research topic area. This study will also provide implications for practice as cloud ERP systems are getting prominent as predicted by year 2015, low-cost cloud services will cannibalize up to 15% of top outsourcing players' revenue (Plummer et al. 2011). This study will provide significant implication to vendors, consultants and ERP clients in several ways. The ERP vendors are an example of beneficiary of this study.

This study will also be a pilot study to understand factors that could be more emphasize towards their client in persuading to adopt cloud ERP product. From client point of view, this study could at least provide a general picture on what they can expect from ERP vendors before making decision whether to adopt or not cloud ERP.

#### IV. RESEARCH CONTRIBUTION

This research paper presents an important contribution to enterprise information system domain as a whole. The author presents a discussion of relevant factors that influence the adoption of cloud-based ERP system; the focus of the paper is based on the factors and their impact to influence the organization to adopt the new technology systems within the competitive industrial. The main result and contribution of this paper is to target both the researchers and practitioners by creating a room for discussion and future investigation within the cloud ERP area. The research paper also further to discuss the concept and operationalizes the factors utilized in cloud ERP adoption. The result contribution of this paper can enhance the general perception of cloud-based ERP system, which will cloud lead to comprehensive change of cloud ERP systems that cloud result in accelerating its diffusion. Certainly, there may be some aspect that the paper couldn't be able to look into, and even additional factors that were not giving consideration with this paper. Although, the factors discussed in this research paper are factors that covers most important aspect within the adoption of cloud ERP with the aim of bridging the gap that lie within current research practice.

#### V. CONCLUSION AND FUTURE WORK

Finding from this research present the most influential factors towards the adoption at the final stage of decision making, the research model is drive from the TAM-DTM model, as discussed earlier, while some existing research has examined the benefits and challenges of cloud adoption, this papers explores a list

of factors that can lead to cloud ERP adoption in SMEs. It also discusses the preliminary findings of research that attempts to identify and categorize each of the extracted factors. Considering that the factors identified could be internalized (organizational factors) or externalized (external factors), the goals is to establish a tough and valid approach to cloud ERP adoption, targeting small-medium enterprises (SMEs) within Nigeria. The research approach for this paper employed two interrelated phases. The first phase was exploratory, with the objective being a conceptual model of cloud ERP adoption in SMEs, findings or results from this study are solely based on secondary data, as obtained from past literature. Therefore, motivational factors are limited to the ranges that have been identified in literature. The second stage involved a series of focus groups planned in order to further improve the findings that have gathered from this study. The final adoption factors will then be tested using a quantitative survey. This study not only has important implications for academic research, by providing a potential set of cloud ERP adoption factors, but also serves as an insight into ideas within this research topic area. The study also has implications on the practical side, as cloud ERP systems are gaining prominence. It is predicted that in upcoming years, low-cost cloud services will cannibalize up to 15 per cent of top outsourcing player's revenue (Plummer et al. 2011). This study has significant implications for vendors, consultants and ERP clients in several ways. For ERP vendors, this study serves as a pilot study for understanding the factors that could encourage their adoption of the cloud ERP product. From the client's point of view, this study can provide a general picture of what they can expect from ERP vendors, before making a decision about whether to adopt cloud ERP or not.

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